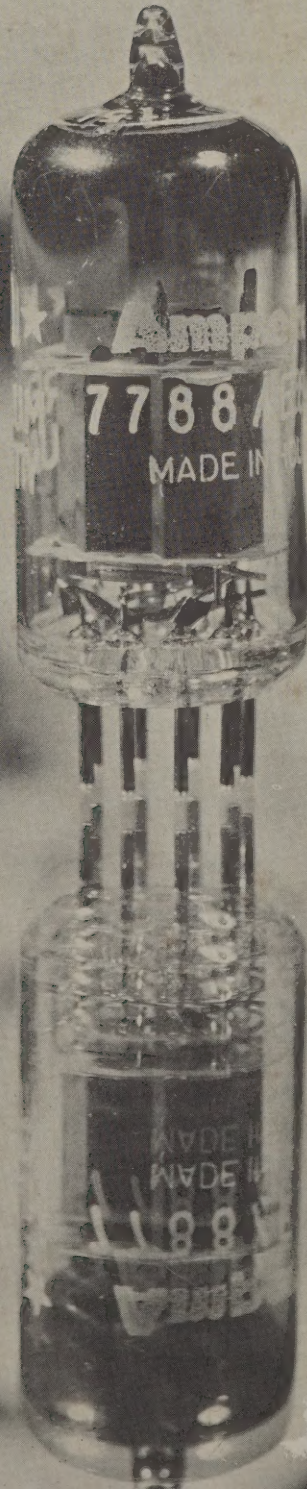


AUGUST, 1962
40 CENTS

Communication

HORIZONS



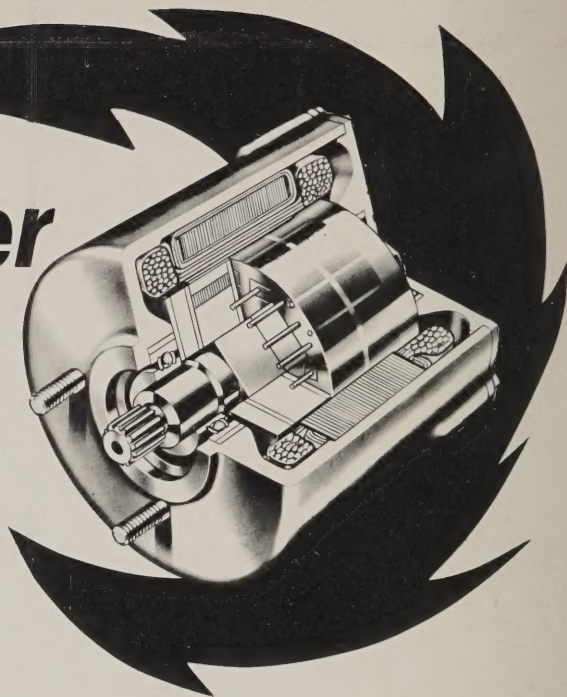
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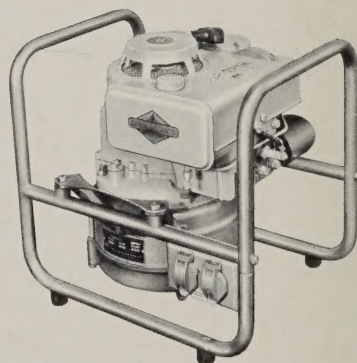
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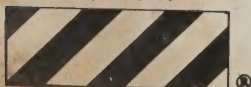
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SPLATTER

from JIM KYLE, K5JKX
CH Managing Editor



IF YOU ARE A REGULAR reader of this column, then you are aware that we're still polishing up our "New Look" for CH. This month, we're inviting your personal participation in helping us judge the outcome of an experiment.

When we changed the magazine's format two issues back, we put a lot of study into picking what we feel was the proper type face for all the articles. The result was the selection you're reading now — and we like it.

But we didn't stop studying, and we found another — completely different — face which also strikes us as being right in keeping with our aims and interests. This left us with a king-sized problem: whether to change over again, so soon, or just ignore our newer discovery.

After several dozen editorial conferences, we came to the conclusion we should have reached much earlier. You, the reader, are the most important man on the CH team. Isn't it about time you had *your* say about what we do with the magazine?

So this month, we had the "lead" article — about Amperex's new type 7788 tube — set in the other kind of type while leaving everything else as it has been. This way, you can see for yourself which you like best — and if you'll just let us know your opinion, we'll let you make the decision for us.

All it takes is a postcard. Say either "I like the old type better", "I like the new type better", "I like them both", or "I don't like either of them — keep looking for more!" And if enough of you register your likes and dislikes in time, we'll announce the results — and put them into action — in the next issue!

You probably also noticed last month that you received the magazine a few days later than usual. This, too, is part of our long-range planning to keep CH one of the newsiest publications in the entire electronics field.

It came to our attention that most key FCC decisions were being announced just a couple of days after our deadline every month.

After a bit of cogitation, we came to the conclusion that most of you would prefer to get the magazine five days later — if by doing so you could get a whole month's fresher news about key rule changes and the like from Washington.

So that's what happened. The deadline was moved back five days, allowing us to get the later Washington developments into print a whole month earlier — and this moved the entire schedule back five days, so you can now expect to receive CH five days later than before.

Is it worth it?

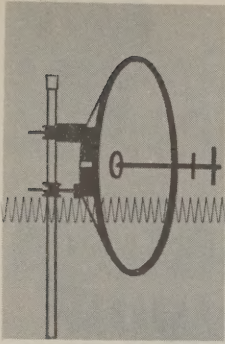
Speaking of Amperex, as we were a paragraph or two ago, we here at CH feel they have come up with a real winner this time in the type 7788. If you turn to the inside back cover and check the contents of "other horizons this month" you'll find that a report on this little baby is also featured in our companion magazine, VHF Horizons.

In ham-type equipment, a pre-amp using the 7788 has almost doubled the range of an already-excellent station (for instance, El Paso has been received from Oklahoma City on 144 Mc).

Naturally, we know that range is sometimes a disadvantage in the communications business — especially when it pulls in the other guy on the channel, loud and clear. But the same qualities that provide this increased range in one application also go to provide better signal/noise ratio in other fields — and we could go on all night about the performance of this basic tube design.

Not reported elsewhere is the fact that the 7788 represents what the computer industry calls "the second generation" of the design. The first such tube was the 6922/6DJ8 (also by Amperex), which is still in wide use in high-quality oscilloscopes, TV camera chains, and the like. The 7788 applied the same principle to pentodes — and we have in our office some application data for the *third* generation of the design! Transistor designers, look out!

—jk



Communication

HORIZONS

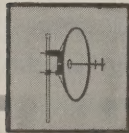
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OUR COVER:

This innocent-looking new tube, Amperex's type 7788, promises to revolutionize the art of VHF reception — offering vastly increased communications reliability because of new construction techniques. Associate editor Russ Miller tells all about it beginning on page 4. (Photographed especially for CH by Cliff King.)

ADVERTISING

Communication Horizons Magazine accepts commercial display advertising from bona fide manufacturers and distributors of communications equipment and associated apparatus. Advertising rate card and coverage data available upon request. Call collect area code 405 Central 2-1108 for advertising information.

CIRCULATION

Communication Horizons Magazine is read monthly by nearly 10,000 two-way communication engineers, technicians, installers and users. Detailed circulation breakdown available upon request.

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SPECIFICATIONS STANDARD RADOMES

Dia. Feet	Type No.	Attenuation @ 6kmc. db	VSWR Contribution @ 6kmc.	Thrust at* 30 psf (Flats), lbs.
10	R10	0.4	0.02	1,990
8	R8	0.4	0.02	1,270
6	R6	0.4	0.02	714
4	R4	0.4	0.02	320
2	R2	0.4	0.02	75

*Including antenna

HEATED RADOMES

Dia. Feet	Type No.	Atten. @ 6kmc. db	VSWR Contr. @ 6kmc.	Thrust at* 30 psf (Flats), lbs.	Power** Reqmts.
10	HR10	0.7	0.02	1,990	3,400 W.
8	HR8	0.7	0.02	1,270	2,400 W.
6	HR6	0.7	0.02	714	1,200 W.
4	HR4	0.7	0.02	320	550 W.
2	HR2	0.7	0.02	75	150 W.

*Including antenna

**Power requirements for HR10 and HR8 are 3 wire single phase 60 cycle 220 volts. Power requirements for HR6, HR4 and HR2 are single phase 60 cycle 115 volts

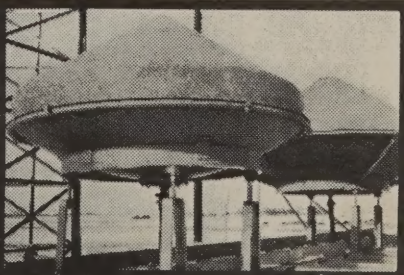
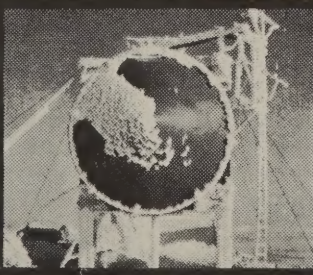
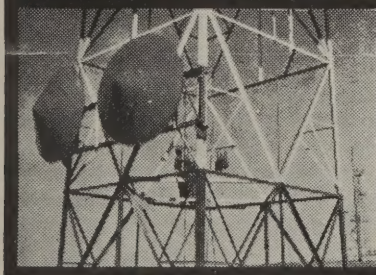
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Improving

RUSS MILLER

ASSOCIATE EDITOR

COMMUNICATION HORIZONS

In general, pre-amps are not normally utilized within the land-mobile field, not because they could not be an asset but rather due to the cost of the tubes applicable to this service in the high-band area.

Here and there though, we have heard comments regarding the usage of such devices and in cases where borderline communications have existed improvement was obtained by the addition of a pre-amp. This brings us back to the cost of such an item, but still more important is reliability. Amperex has recently released a tube, designated the 7788/E810F, which has a price of less than \$11.00 and

lends itself to this service. This tube is rated for 10,000 hours of service — certainly a reliable item!

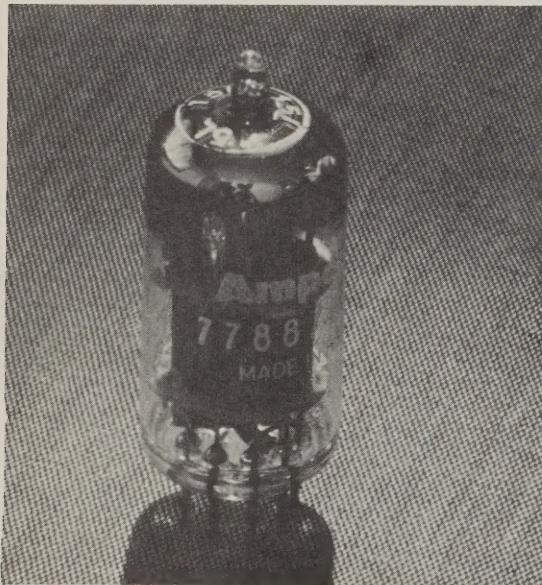
The 7788 is first of all **not** a direct replacement for any of our conventional tubes, but it does have a **definite** application in the 2-way realm — especially in high-band base station equipment. Its features are generous: a 50,000 micro-mho Gm (Transconductance) rating and a low Req (equivalent noise resistance) of 100 ohms. Not to be slighted is its 9-pin miniature envelope and the unusual fact that this tube is a pentode. Indeed this tube should fill the bill for a high-gain, low noise pre-amp stage.

Here also is certainly a case where the 7788's 10,000 hour rating makes it a real asset. Although none of these tubes are in current use in 2-way equipment, it is hoped that before long we may see some. Using the tube in this application does not pose any particular problems, as operation in a test pre-amp has proven. A few direct rules must be followed in adapting it, though, and if attention is given to these, excellent results can be obtained.

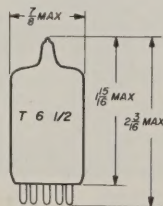
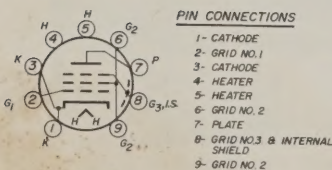
In pre-amp usage, the 7788 should be operated with a plate voltage of 120 VDC and screen voltage of 150 VDC. This, in conjunction with a bias voltage of approximately -1.9 VDC, will result in plate and screen currents of 35 mA and 5 mA respectively.

Due to the rather rapid change of plate current with a relatively minor change in bias it is recommended that a fixed bias source be utilized to preclude possible damage to the tube. Considerable success has been had with a bridge rectifier connected to a 6.3 VAC filament transformer. Using a 275 mfd. filter, this will supply -8.6 VDC which can be applied to the tube through a suitable voltage divider or pot. Since the grid has a relatively low dissipation rating, it is suggested that some form of blocking bias be applied to it while the transmitter is functioning. A value of -18.5 VDC has proved to be sufficient when used with a transmitter providing 250 watts of RF output, provided a good co-axial antenna relay is utilized to minimize RF leakage. Control over the normal operating bias and blocking bias can be obtained by using a small relay, in parallel with the existing relay circuitry in the push-to-talk system or energized via the carrier-operated relay.

Some form of decoupling will be necessary between the fixed bias supply and the tube, along



Unprepossessing appearance of the 7788 belies its electrical characteristics. Almost-invisible control grid is secret of design.



Base connections of type 7788.

Communications

Reliability

with a means to prevent removal of bias during the time the control relay is in the process of transferring from one bias source to the other.

The filament supply is conventional since the tube requires 6.3 VAC at 340 mA. The stability necessary for proper operation is achieved by by-passing both screen connections with low inductance capacitors of about .001 mfd. A word about low inductance capacitors: the conventional silver button mica is an excellent choice, along with some of the newer stud mounted varieties such as the Sprague BH-140. This should not be allowed to limit you, though, if due consideration is given to the choice of capacitor when the aforementioned types are not readily available. Shielding between input and output is a necessity, as well as adequate decoupling if DC power is supplied by sources in the base station equipment.

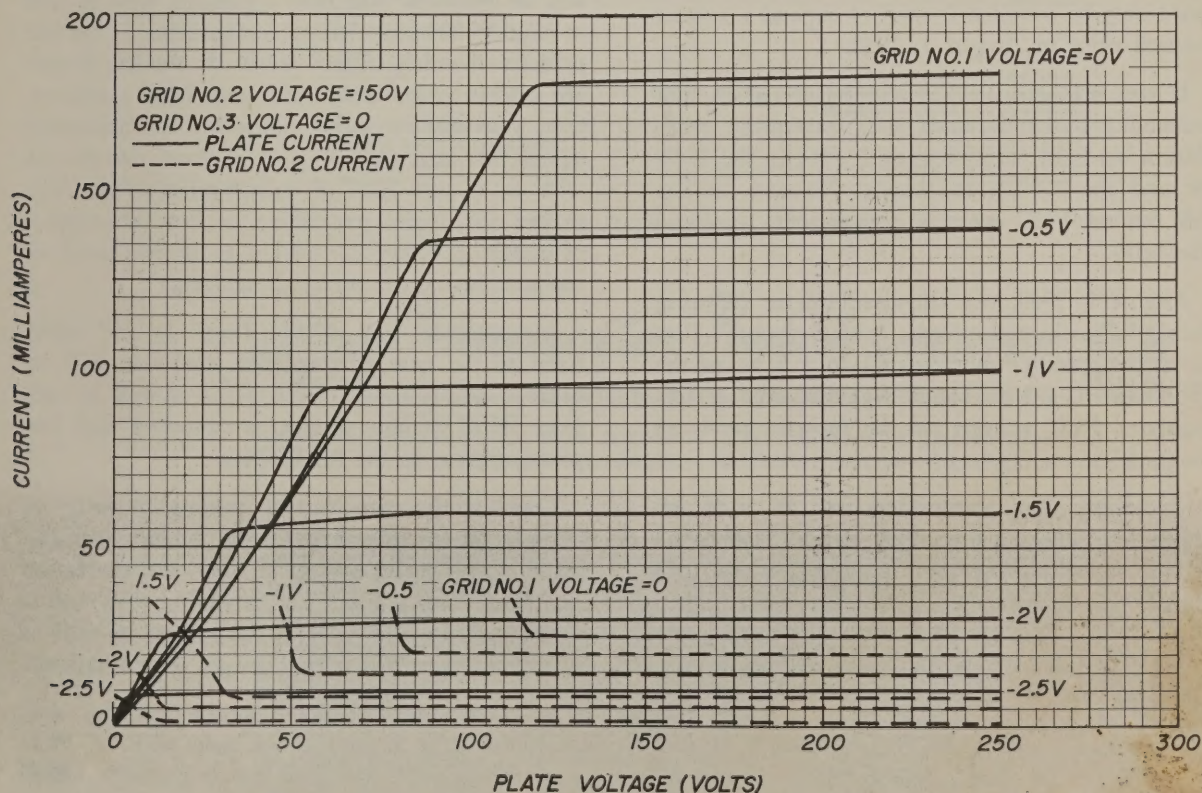
A series-tuned resonant network should be utilized in the grid circuit, along with a parallel resonant network in the plate circuit for best operation. The series tuned grid circuit is necessary because of the

high input capacity of the tube. Maximum ratings for the tube are 5 watts plate dissipation and 1 watt screen dissipation. Care must be used in adjusting the bias levels as mentioned previously so these values are not exceeded. If careful analysis is made of the tube characteristic curves, you will see that a bias change of $\frac{1}{2}$ volt will result in a plate current change of **over 20 mA**.

Coupling of the antenna to the grid circuit can readily be accomplished with a 2-turn link loosely coupled. The same method applies to the plate circuit, although slightly closer coupling should be used. Actual coil data is dependent upon the exact frequencies involved, and should be finally checked with the use of a grid-dip meter.

Several tests have been conducted on the CH test pre-amp using the 7788, with excellent results. As a basis for thought, a 6 db. S/N ratio check was made using a HP-608D with a 6 db. pad. The results showed that only 0.11 μ V was found necessary to give us this figure. Of further interest is the fact that this figure was obtained using a receiver with considerable wider bandpass than our normal FM equipment. Exact improvement figures will depend upon the individual application.

Mountain toppers take note: the reliability factor will save you from that extra trip.



Type 7788 plate-family characteristic curves.

NBFM Deadline Nears

DOES all equipment in your mobile radio system meet FCC narrow-band technical standards? If you originally installed a wide-band system, have you converted or replaced the old equipment with new equipment meeting the new, more stringent narrow-band standards? If you haven't, now is a good time to plan to do so; the final deadline is drawing near.

New narrow-band standards come into full effect on November 1, 1963. By that time all transmitters must be in compliance with the FCC rules. Receivers should comply if you are to get the best performance in range, freedom from noise, minimum squelch burst and freedom from adjacent channel interference. This is more than ever likely to occur with split-channel assignments treated with the same degree of frequency coordination as the primary channels.

More than three of the five years period allowed by the FCC for the transition of our services from wide-band to narrow-band are now past. Since August 1, 1958, newly licensed transmitters operating under Parts 10, 11 and 16 of the FCC Rules have been required to meet narrow-band technical standards. New wide-band transmitters could only be installed if used to expand a system licensed prior to August 1, 1958.

If you operated an old wide-band system, the probability is that by now your transmitter modulation has been reduced from $\pm 15\text{kc}$ in the 25-50 mc and the 152-174 mc bands. (Certain services did request FCC waivers on un-split low-band channels).

August 1, 1960, was the deadline for reducing the deviation in transmitters operating under Part 10 of the rules (Public Safety) to $\pm 5\text{kc}$ in the 25-50 and 152-174 mc bands. Again certain services requested FCC waivers on the un-split low-band channels.

Assuming your transmitters are all now adjusted for $\pm 5\text{kc}$ swing, there are two other requirements you must meet by the final cut-over date, November 1, 1963. First, transmitters operating in the 25-50 mc band must now have a frequency stability of 0.002% and in the 150-174 mc band 0.0005%.

Second, each transmitter must include a low pass audio filter placed between the instantaneous

by **JOHN A. McCORMICK**
G-E Communications Products Dept.

modulation limiter and the modulator stage of the transmitter. Equipment originally supplied as being in compliance with the narrow-band standards of course contains all three features as supplied by the factory — namely, $\pm 5\text{kc}$ swing, the 002 or 0005% frequency stability as required, and the low pass audio filter.

If you originally installed a wide-band system, it was not very difficult to meet the interim requirements that reduce transmitter swing, that is the change from $\pm 15\text{kc}$ to $\pm 5\text{kc}$. Most transmitters in these services contain a potentiometer which allows a screw-driver adjustment to either desired level of modulation.

In many systems, it has been possible to continue operating with wide-band receivers, even with transmitters providing narrow-band swing. However, in the interim period the FCC has required coordination of the use of these split channels in an effort to protect the existing wide-band systems. As of November 1, 1963, this protection will be removed and new applicants will be just as eligible for split channel assignments as far the primary channels in any particular service. If you are operating on converted wide-band receivers, then you may be quite vulnerable to interfering signals on each side of your channel due to the wide acceptance band of wide-band receivers. The proper and logical correction of this interference of course is either conversion to narrow-band or replacement of the affected receivers.

Inasmuch as any change from the old wide-band to the new narrow-band standards will require a certain amount of time, it is well to consider what change, if any, is necessary and implement plans in the near future.

Consider the economics of trading in your old equipment in favor of today's modern designs. As part of your up-grading and modernization program, evaluate the new transistorized equipment which is currently on the market as well as the partially transistorized designs now available.

Whatever your preference, begin planning now, so you will be in full compliance with all FCC regulations before the deadline is reached. ■



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Cat. No. 79-509 2X-Gain Antenna combines the simplicity of a coaxial antenna with the gain of a more complex structure. Though external appearance is that of a standard coaxial antenna, the union of special element lengths and internal matching devices produces 3 db omnidirectional gain.

SPECIFICATIONS

Electrical:

Nominal input impedance	50 ohms
Maximum power input	500 watts
Omnidirectional gain	3 db
Internal feedline	RG-8A/U
Flexible terminal extension	18" of RG-8A/U
Termination	Type N male with Neoprene housing
VSWR	1.5:1
Bandwidth	±1%
Lightning protection	Star gap

Mechanical:

Skirt	2" dia. red brass
Whip rod	6061-T6 aluminum
Support pipe	1-5/16" dia. hot-galvanized steel, 24" minimum length exposed available for mounting
Rated wind velocity	100 MPH at 150 Mc
Lateral thrust at rated wind	19 lbs. at 150 Mc
Bending moment 6" below skirt	55 lbs. at 150 Mc
Weight	30 lbs. at 150 Mc

**Exact frequency must be specified*



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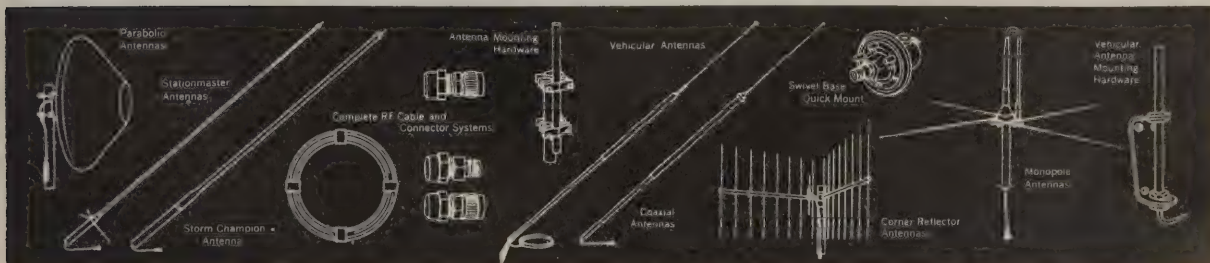
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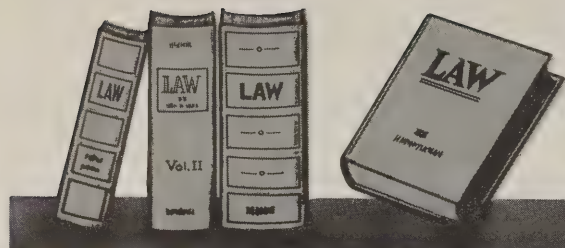
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the LEGAL SPECTRUM

by Jeremiah Courtney
Washington D. C. Attorney



FCC Non-Broadcast Fines

IN September of 1960, the FCC received Congressional authority to levy money fines against broadcast stations for certain Communication Act, Rule, and license violations. The penalties range from \$1,000 to \$10,000 and the FCC has not hesitated to exercise its new-found power in a series of violation cases, many of them looking to the maximum penalty.

This has recently led a leading Washington broadcast engineering firm—in words that may not be without a touch of prophecy for the mobile radio field—to warn its broadcast clients in a special manual prepared for the purpose, in part, as follows:

"The Commission as never before is rigidly enforcing among other things its technical rules, and if you have not already had a detailed inspection, you can expect to have one in the near future. Contrary to some opinion, F.C.C. Field Inspectors do not have horns protruding from their heads, nor appendages hanging to the rear. They, like the rest of us, are only human and are trying to do their job as they see it. Many do not see it the same way they do, but unfortunately, unless the inspector is completely off base, it's best to adjust your sights on the same level as his, and save a lot of grief all the way around."

This characterization of the FCC field inspectors does not do them full justice. From the reports flowing in to us from many station licensees, if the FCC field inspectors have not actually worn halos on their station inspections in the mobile radio field, they are without a doubt one of the kindest group of people ever assembled in a single profession. This is a tribute to the gentlemanly manner in which the FCC field inspectors have conducted themselves over a long period of time in their personal contacts with non-broadcast station licensees.

This, in turn, has led most mobile station licensees to look upon the FCC field inspector in his recurring visits as their understanding "friend".

Unfortunately, when the friendly station inspection is over, a written report is made; and that cold, impersonal report is read by someone, usually in Washington, who never saw the station licensee; doesn't know what a fine and responsible person he is or the problems of his business; and who, all too frequently, lives by the Rule book alone. That Rule book now includes money penalties.

This is the blue-print of impending pecuniary troubles which now confronts the mobile radio field. For we may now expect the FCC to enforce its non-broadcast Rules more frequently, and more severely.

The 12 types of violations for which forfeitures may be imposed, ranging from \$100 for a single violation up to \$500 for a series of five or more violations, were itemized in the CH issue of June 1962. It was also noted there that four of the 12 types of violations run against the station operator as well as the station licensee, raising the total fine that may be imposed in any single station inspection to a collective maximum of \$900.

We expect the Commission within the next few months to issue a set of procedural rules governing the imposition of the forfeitures which may be imposed under new Section 510 of the Communications Act. But the FCC has the authority now, effective June 10, 1962, to impose forfeitures without any procedural or other clarifying regulations.

While much case law will undoubtedly be developed under Section 510, at least one general and fundamental guide may be offered at this time. The regulatory agency, in the nature of things, must rely on the written statements of its applicants and licensees. As the Commission itself said in **Palm Springs Translator Station, Inc.**, 17 R.R. 1263 (1959):

"Truthfulness and candor on the part of applicants in statements contained in applications and reports are important to the Commission. In the bulk of its actions, it must act on the basis of written representations made by applicants. Kanawha Valley Broadcasting Company, 3 R.R. 1977, 1988, 1948."

The Supreme Court has similarly observed in **FCC v. WOKO**, 329 U.S. 223, 227:

"The fact of concealment may be more significant than the facts concealed. The willingness to deceive a regulatory body may be disclosed by immaterial and useless deceptions, as well as by material and persuasive ones. We do not think it is an answer to say that the deception was unnecessary and served no purpose."

If the FCC had one hundred times the staff it now has, it could never hope to check the veracity of the thousands of applications, reports, statements and other documents that weekly pour in upon it. Since it must rely on the honesty of the statements submitted, the FCC Commissioners and staff take a very dim view of inaccuracies or concealments. Any effort to "twist" the Commission could therefore prove costly, possibly transforming a relatively minor, or in any event explainable, offense into a major offense which might lead to a station revocation proceeding.

In dealing with FCC Rule or license violation matters, therefore, Benjamin Franklin long ago outlined the fundamental approach: "Honesty is the best policy." To most users and the long-established and closely managed sales and service agencies, this advice may seem fairly elementary.

But new users, new agencies, and new salesmen for the established agencies, are constantly entering the field; and there is always the customer whose immediate radio use, or some type of unauthorized use, is so important to him that he is willing to take a chance.

Be sure that the customer takes the chance on his own. Any cooperation with such a customer can be fatal because, if any FCC trouble arises, our experience in these violation cases shows that the customer will normally not hesitate to share his troubles with his better informed local advisor, if he can thereby extricate himself. The money penalties around the corner can only serve to accentuate this thoroughly human and often justifiable tendency. Anyone holding a first or second class operator license would do particularly well to be guided accordingly.

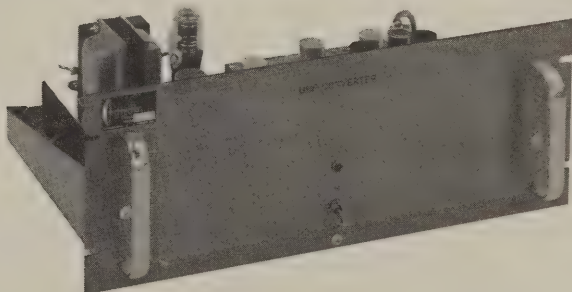
Dear Editor—

Mr. Bill Yee, one of your readers, sent us a request concerning our new type 7984 communications tube. Unfortunately, he did not include his address in the letter. Perhaps we can locate him through this means. We would like to have him know that we are anxious to serve.

Best regards,
Steve McCallum, General Electric Co.
Receiving Tube Dept., Owensboro, Ky.

UHF FREQUENCY MEASURING CONVERTER

450 to 460 Mc



The Centimeg 450-FC Converter is designed to measure the frequencies and modulation deviation of communications transmitters in the 450 to 460 Mc band . . . without having to take the equipment to the transmitter or bring the transmitter to the equipment. The 450-FC also provides a means of monitoring remote relay stations and base stations. The Centimeg Converter is used in conjunction with existing 150 Mc equipment such as the Motorola T11-30A or T11-31A FM station monitor or equivalent equipment.

The 450-FC converter is broad banded from 450 to 460 Mcs, and has a sensitivity of 1 microvolt over the entire band. Signals in this band are converted down to 150 Mcs. The output of the converter is broad banded from 150 to 160 Mcs. The ability to measure frequencies in the 450-460 Mc band accurately is made possible by providing a very stable injection frequency of exactly 300 Mcs to the mixer stage of the converter. No spurious harmonics of any kind are generated in the 450-460 Mc region nor in the 150-160 Mc region. The injection frequency is originated by a 5 Mc crystal operating in an oven. There is a control in the oscillator circuit whereby the crystal may be "pulled" into exact zero beat with Bureau of Standards radio station WWV.

Specifications: Input Frequency: 450-460 Mcs — Output: 150-160 Mcs — Sensitivity: 1 mv furnishes at least 10 db signal/noise ratio throughout band. — Overall Gain: 23 db ± — Input Impedance: 50 ohms nominal — Output Impedance: 50 ohms — Conversion Accuracy: Short term of 1/2 hr., .00005%. Long term 30 days, .0001%.

\$560

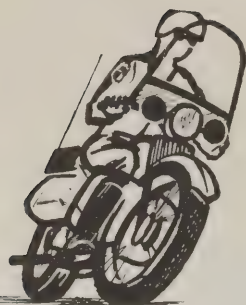


CENTIMEG ELECTRONICS

312 E. Imperial Hwy.

— El Segundo, Calif. —

SP 2-1032



PUBLIC SAFETY COMMUNICATIONS

by Robert E. Brooking, Communications Engineer — City of Burbank, California

IN THE LAST several years many governmental entities have found it necessary to use frequencies between 450 and 460 Mc for some of their Public Radio systems. As a result of the increased use of this part of the spectrum, as well as others, by the various land mobile services, the channels were split and a frequency tolerance of .005% was instituted. Most of the existing devices for measuring frequencies had an accuracy of .001% so those of us with the responsibility for meeting the technical standards of the Federal Communications Commission began looking for new measuring devices having a greater degree of accuracy.

For those of us having either low band or 150.8-162 Mc systems, (and who doesn't?) the Motorola Station Monitor offered the ideal answer. This instrument not only possessed the required frequency measuring capability, (complete with built-in WWV receiver) and deviation (FM swing) meter; but also, it could read mobile units in the field and remote base stations. Thus, it was possible for the technician to observe the systems in daily operation without leaving the shop and to call in those mobile units requiring adjustment at the time noted instead of waiting for complaints.

This device also provided relative field strength measurements so that performance of a remote base station could be continuously checked at the repair facility. However, no such device was available for use in the 450-460 Mc band. There were several methods available: counters with translation units providing digital readout; heterodyne frequency meters; or the Motorola Station Monitor could be used to read the driving signal to the tripler stage.

All of these methods had one thing in common; the requirement that the signal from the unit being measured have a strength in millivolts rather than microvolts. The mobile units could be brought to the radio shop but base and repeater stations presented a real problem. Not only was it necessary to move the measuring equipment and a man to the base station site but also some means of keeping power on the measuring equip-

ment while enroute was a must. The accuracy of a cold frequency meter is highly doubtful.

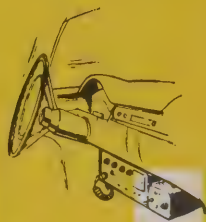
There had to be a better way. If it was possible to measure frequencies in the 25-50 Mc and 150.8-162 Mc bands "off the air," then it should be possible to do the same thing with the 450-460 Mc band. Since there was nothing available commercially that would do the job, the Communications Department of the City of Burbank undertook the project of building such a device.

The theory developed was simple enough: convert the 450-460 Mc band down to 150-160 Mc by the superheterodyne principle. This would require a demodulator (mixer) and a local signal of 300 Mc. The output would then be the difference, and by controlling the 300 Mc injection frequency closely, it would then be possible to measure the frequency on the Motorola Station Monitor. To provide the needed accuracy, it was decided to start with a 5 Mc crystal in a good oven. A trimmer would provide for exact adjustment while beating against the signals of WWV in a receiver. The plate circuit of a pentode oscillator tube would be tuned to the fifth harmonic (25 Mc). This would be followed by two triode doubler stages (50 Mc and 100 Mc respectively) and a tripler stage to 300 Mc. The output would be fed to a diode mixer which would be preceded by a grounded grid RF stage using a 7077 ceramic tube.

When completed, the results were amazing; the Station Monitor blocked and refused to measure anything. So the output of the oscillator multiplier unit was fed into an APR-4 receiver. The reason for the trouble was immediately obvious. Not only was there a signal at 300 Mc but also at 100, 150, 200 and 250 Mc. In addition, there were minor indications every 5 Mc.

Coupling capacitors between stages were reduced but the trouble still prevailed. It was becoming increasingly apparent that some new design on the multiplier chain was essential. By using an inductively coupled, double tuned circuit at 25 Mc it would seem logical that the five Mc "pips" would be removed.

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- Single switch, easy operation. Three positions: Selective Receive, Normal, and Call.

- Multiple tone burst. Most selective call devices use a single tone burst. With a single tone system the decoder is subject to false triggering because of squeals and voices. Monocall's multiple tone burst and computer circuitry all but eliminate this undesirable property.

- Inexpensive. Monocall Encoder - Decoder, \$59.95. Monocall Encoder, \$29.95.

- The advance design of the Monocall provides a reliability superior to devices using conventional tube or transistor circuitry.

- Easy to install. Only minutes required to attach Monocall to your existing Citizen Band or Communication unit. Also, a number of Citizen Band sets are already wired for immediate Monocall "plug-in" use. They include the Starcaster Citizens Band Units Mark I, Mark II, and Mark III; the Realistic TRC-8 Citizen Band Unit; and Metrotek Citizen Band Transceivers.



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This left the problem of 100, 150, 200 and 250 Mc signals to solve. Again, inductively coupled, double tuned circuits looked like part of the solution but that 150 Mc signal worried us the most, since it would block the Station Monitor. After thinking about this one for awhile, a solution appeared: the push-push amplifier. This circuit would effectively eliminate odd order harmonics.

By using this circuit it would be possible to double the 50 Mc signal to 100 Mc without any trouble at 150 Mc. For the tripler stage a push-pull circuit would do the job while cancelling any 200 and 400 Mc output. Of course proper shielding and decoupling would be a requirement.

Since the shop facilities did not include equipment for properly fabricating the stage shielding and other metal parts, it was deemed advisable to contact an organization specializing in UHF receiver and converter design. A phone call to Ed Lush at Centimeg Electronics was made and the information was turned over to him for development. He looked over our efforts, studied our ideas, made a bunch of notes and left.

A few weeks later Ed returned bringing along a prototype of our "mousetrap." Tests proved that

the device worked but the 5 Mc difference between frequencies in repeated systems presented a sensitivity problem. Ed determined that a gain of at least 20 db would be required since the overall sensitivity of the Station Monitor might be eight to ten microvolts.

He returned a couple of weeks later with the modified version, which has a gain of more than 23 db between the 450 Mc input and the 150 Mc output.

A 450 Mc ground-plane antenna, 40 feet above ground was connected to the input circuit through a coaxial line with 10 db loss. The City operates three 450 Mc systems with frequencies used extending from 451.05 Mc to 458.90 Mc. Tests showed that the sensitivity of the unit was sufficient for our work. A gain antenna, more height, less coaxial cable loss or a combination of all three would provide still more coverage if necessary.

Need one? Centimeg sells them now. I'm sure a note to Ed at 312 East Imperial Highway, El Segundo, Calif., would get you full specs and price data.

THE SINCLAIR MODEL 233 V. H. F. GROUND PLANE ANTENNA

PERFECT FOR TEMPORARY BASE STATION OR MOBILE COMMUNICATIONS APPLICATIONS

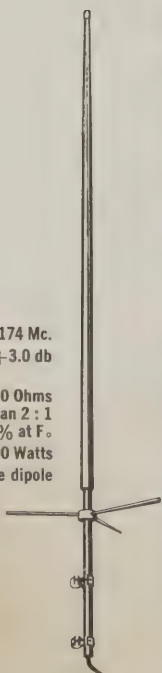
The long felt need for a high gain omnidirectional antenna, priced under \$100.00, led to the development of the Sinclair Model 233 Ground Plane Antenna.

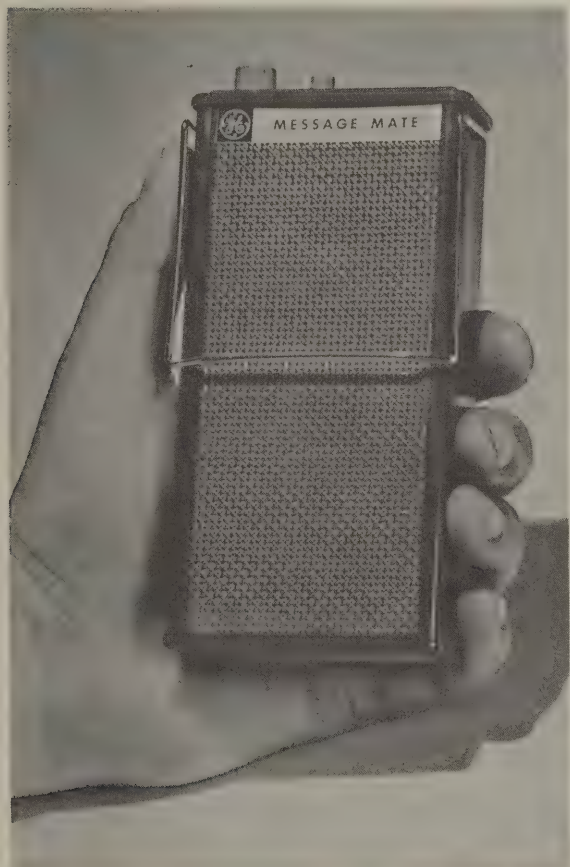
Outstanding among the 233's many quality features is its high 3.0 db gain — in the 150 Mc. Band — and its unusually light weight and small size. Built entirely of anodized aluminum, and with driven elements lightning grounded and protected from "icing" by a fiber-glass radome, the Sinclair Model 233 Omnidirectional Ground Plane Antenna insures years of functional operation at the lowest possible cost. Write* today for Bulletin 62-ANT-233 for full information.

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*Referred to a $\frac{1}{2}$ wave dipole





Signalling, Voice Pocket Set

General Electric has developed a new pocket sized receiver, which they say is the only VHF-FM personal paging receiver in the economy field which has both tone signalling and voice message.

The 10-ounce "Message Mate" set is less than 3 inches wide, 5.4 inches long, and just over an inch thick — not much larger than a pack of "imperial-size" cigarettes. It provides 100 milliwatts of audio output.

The "Message Mate" is compatible with both low- and high-band systems and is designed for use with selective-calling apparatus.

For complete specifications and data, write to Section P of GE's Communication Products Department, P. O. Box 4197, Lynchburg, Va.

60 CFM Noiseless Ventilator

A new, "super-silent" fan for cooling electronic apparatus, designed to move 60 cubic feet of air per minute and having a noise level of only 18 db S.I.L., has been announced by *Rotron Manufacturing Company, Inc.* Woodstock, N. Y.

The new unit, called the Whisper Fan, draws only 7 watts from a standard 117 VAC line. It will be on display in booths 2035 and 2036 at the Wescon Show — or you can write to Rotron for full data.

2-KMC Microwave Equipment

A new series of 2-KMC microwave equipment, designated LRC-3, has been announced by *Philco Corporation*.

The LRC-3 series extends Philco's product line to include additional equipment for the 2-KMC band. Features include a unique phase lock receiver and a crystal-controlled FM transmitter. Configurations for one-way or two-way, standby, dual diversity, or quadruple diversity operation are available.

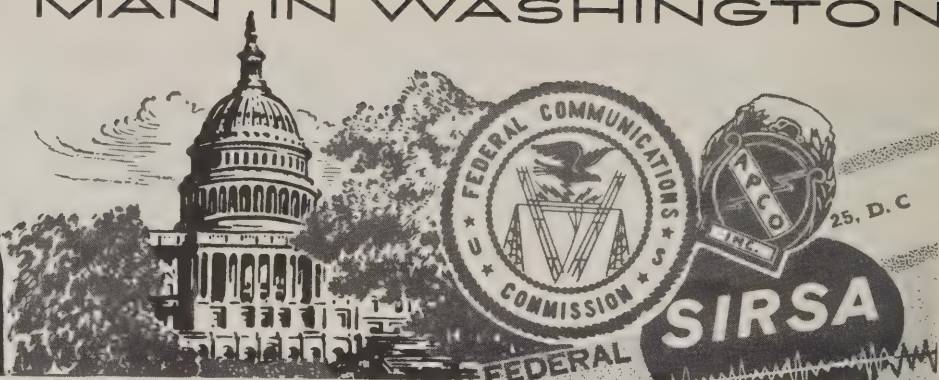
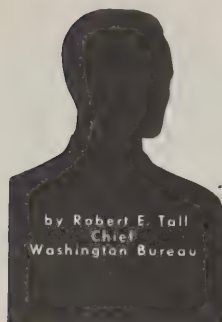
Noise figure of the receiver (including diplexer loss) is 10.5 db. When equipped with an optional tunnel-diode amplifier, this drops to 3.5 db.

For complete data, write to Philco Industrial Products, 4700 Wissahickon Avenue, Philadelphia 44, Pa., and tell them you saw it in CH Showcase.

Waveguide Components

A new technical bulletin discussing mechanical construction, configuration, materials, and performance characteristics of rectangular waveguide components has just been released by *Gabriel Electronics*, Millis, Mass. A copy is free for the asking; contents include dimensional schematics for each major component type, and a listing of the various length-and-flange combinations available from stock.

OUR MAN IN WASHINGTON



BIG CHANGES ASKED IN 25-42 MC DOCKET

Major changes in the proposal (docket 14503) to service-allocate frequencies in the 25-42 Mc band—or a 90-day extension of comment deadline, already extended once to August 1—have been requested by the City of Cleveland in a 30-page set of comments on the proposal.

Among the changes requested by the Ohio metropolis were review of channel separation in the light of previous FCC decisions; adherence to “the original plan” of having any split channels derived from police and fire groups assigned exclusively to the police and fire services; and re-evaluation of the relative need of other services for channel space.

The Cleveland comments expressed the opinion that the earlier “preferential position” given the police and fire services by the Commission “has been largely lost” because the skillful presentations of “business and industrial groups” and similar organizations have “overpowered the presentations made by the various fire and police agencies.”

SSB SYSTEM AUTHORIZATION ASKED

Developmental authority for a 51-station single-sideband radiotelephone system using two low-frequency Marine bands has been asked by the Offshore Co., Baton Rouge, La.

Offshore asked licensing of one limited coast station at Baton Rouge, 20 fixed stations at temporary locations on drilling rigs in the Gulf of Mexico, and 30 installations on vessels serving the rigs.

Frequencies requested were 6204 and 8276.5 kc, but the company said it will accept any other channels in the 6200 and 8200 kc bands which the FCC may “deem appropriate.”

In the reasoning behind the request, Offshore said VHF operation was impractical because of range requirements (up to 1,000 miles) and other low-band frequencies were overcrowded. The rigs in question are now equipped with VHF, and

when range becomes too great for VHF use, shift to a SSB system in the 2-4 mc band.

HIGHER TOWERS IN SIGHT

Possible revision in FAA antenna-height regulations to allow construction of radio towers up to 500 feet high (in remote areas) without FAA authorization have been revealed by the FAA official in charge of obstruction evaluation.

Oscar W. Holmes, chief of the FAA’s obstruction evaluation branch, told the National Committee for Utilities Radio that rules changes are in progress. The new rules would allow towers up to 200 feet high near air lanes, and up to 500 feet in remote areas, without FAA notification or approval.

Holmes also said the FAA has adopted the FCC’s rule that Aviation Agency notification is not now required for antennas extending less than 20 feet above existing structures.

SPLIT CHANNELS FOR 450 OPPOSED

Channel-splitting in the 450-470 Mc band is not advisable, and the split-channel proposal in docket 13847 should be withdrawn, the FCC has been told by industry.

The Land Mobile Communications Section of the EIA, in its comments on the docket, said a comprehensive engineering review by an industry ad hoc committee showed no solution to “the problems of interference, frequency drift, and range restrictions” set forth in EIA comment on an earlier but similar proposal.

Since split channels still do not appear to be feasible from a technical standpoint, EIA requested two other approaches to the channel-space problem: The first was allocation of “additional frequencies”; the other was a suggestion that the present system of block allocation be supplemented by a block-pool system, to utilize the geographical sharing of channels based on a system of “centralized frequency coordination.”

about . . .

NEWS

An axiom of the publishing business is that a "news" publication should never **make** the news, but should confine itself to **reporting** what other people accomplish.

We at COMMUNICATION HORIZONS do not subscribe to this axiom. Whenever possible, we prefer to help **make** the news in the entire non-broadcast radio field!

An example of our feeling in this regard is this month's cover story: we believe that the 7788 tube by Amperex will revolutionize the art of VHF reception, and we're proud to have been the discoverers of this tube for VHF receiving use. Of course, the bulk of the credit must go to the Amperex engineers and designers who came up with the tube in the first place—and we'd like to take this opportunity to most cordially thank them for all their help in our application-development program.

This is not the only application-development program now under way at COMMUNICATION HORIZONS. We have a number of other projects on the fire, which we'll report in full when we feel they are properly developed. Or, in other words, we're still hard at our jobs of first **making** the news **then** reporting it.

Naturally, you'll find out the most about such developments from the people who do them. And at the same time, we are continuing to report everyone else's achievements. For the best and most complete coverage of the two-way world, COMMUNICATION HORIZONS is the only answer.

Are you a subscriber? If you're not, turn this card over and fill in the form on the back. Then airmail it to us, and you'll be sure of getting all the news, as soon as it happens, from The Professional Communications Journal, COMMUNICATION HORIZONS.

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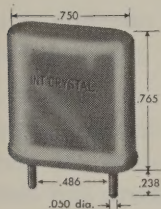
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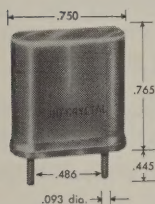
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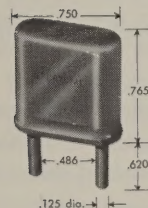
CRYSTALS



F-605



F-609



F-612

FREQUENCIES 70 KC TO 137 MC

DESCRIPTION AND DATA:

All of these crystals are of the plated, wire-mounted type. Low drift AT-cut blanks are used in these units above 500 KC, and low drift DT and CT-cut blanks are used in units below 500 KC; any crystal can be supplied for operation with or without an oven.

TEMPERATURE TOLERANCE:

AT— $\pm .005\%$ from -55° to $+90^\circ$ C.
 $\pm .002\%$ from -30° to $+60^\circ$ C.
 DT-CT— $\pm .01\%$ from -40° to $+70^\circ$ C.

CALIBRATION TOLERANCE:

Supplied to meet equipment manufacturers specifications and may be as close as .001% without oven or .0005% with oven. Where no equipment is specified the following will apply.

AT— $.0025\%$ of nominal at $+30^\circ$ C.
 DT-CT— $.01\%$ of nominal at $+30^\circ$ C.

DRIVE LEVELS:

Maximum, AT—
 10 milliwatts 500 KC to 999 KC
 4 milliwatts 10,000 KC to 24,000 KC
 2 milliwatts 25 MC to 137 MC
 DT-CT—2 milliwatts

CIRCUIT: As specified by customer. Crystals are available for all major two-way equipment and in most cases the necessary correlation data is on file. Where circuit is not specified, the crystal will be calibrated for operation into a load capacitance of 32 mmf.

FREQUENCY RANGES AND MODES OF OPERATION

200-500 KC:

Operates on fundamental edge shear oscillation. Load capacitance 32 mmf or as specified by customer. If load is not known specify circuit or equipment in which crystal will be used.

500-20,000 KC:

Operates on fundamental face shear oscillation. Load capacitance 32 mmf or as specified by customer.

10-60 MC:

Operates on third mechanical overtone at anti-resonance. Will give reasonable output in tuned circuit.

60-100 MC:

Operates on fifth (or seventh) mechanical overtone at series-resonance. Drive level must be kept below 2 milliwatts.

ONE DAY SERVICE

Orders for less than five crystals are shipped within one working day following receipt of order (except low frequency and special crystals which require 10 to 30 days for processing). Orders received on Mon. thru Thurs. will be shipped the day following. Orders received on Fri. will be shipped the following Mon. Postage is prepaid within continental U.S. when cash accompanies order. All others are shipped F.O.B. Oklahoma City.

SUPPLY THIS INFORMATION WHEN ORDERING

MOTOROLA: Crystals can only be properly correlated for Motorola equipment if the crystal type number is given. Example: D02, R28, D03, etc. In cases where crystals are required for type D-14, 800 and 801 holders, always specify crystal frequency or the high IF frequency. Check whether the crystals are to be used in ovens.

GENERAL ELECTRIC: Specify model number of transmitter and receiver RF Decks. Example: 4ES13A3, 4ER24B1, 4ET5B3, etc. When ordering crystals for 450 MC equipment specify:

Receiver Crystals:

A. If they are heated or non-heated.

B. If the unit is AFC or NON-AFC

Controlled.

C. Platter number of present receiver deck.

R.C.A.: Specify model number of unit or MI Number of the crystal. Always indicate whether crystals are to be non-heated or heated type.

OTHERS: Specify model number of the receiver and transmitter as well as any formulae that pertain to the correct crystal calculation.

Transmitter Crystals:

A. If they are heated or non-heated.

PRICES — F-605, F-609, F-612 CRYSTALS

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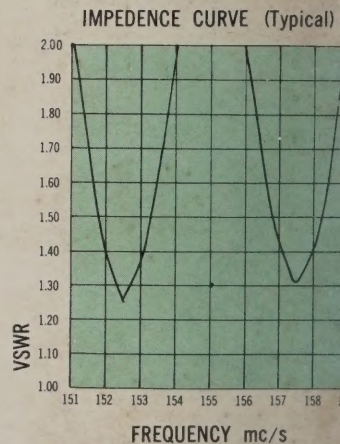


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